Customer No. 2325

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appellant:	EL GAMAL *et al.*	Examiner:	Pham, Hoa Q.
Serial No.:	10/663,935	Group Art Unit:	2886
Filed:	September 16, 2003	Docket No.:	STFD.039PA (S01-276)
Title:	BIOLOGICAL ANALYSIS ARRANGEMENT AND APPROACH THEREFOR		

AMENDED APPEAL BRIEF

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Customer No. 40581

Dear Sir:

This Amended Appeal Brief is submitted pursuant to 37 C.F.R. §41.37, in support of the Notice of Appeal filed October 29, 2007 and in response to the rejections of claims 1-37 as set forth in the Final Office Action dated July 30, 2007, and in further response to the Advisory Action dated October 12, 2007.

If necessary, authority is given to charge/credit Deposit Account 50-0996 additional fees/overages in support of this filing.

I. Real Party In Interest

The real party in interest is The Board of Trustees of the Leland Stanford Junior University, having a principal place of business at 1705 El Camino Real, Palo Alto, CA 94306-1106. The above-referenced patent application is assigned to The Board of Trustees of the Leland Stanford Junior University.

II. Related Appeals and Interferences

While Appellant is aware of other pending applications owned by the above-identified Assignee, Appellant is unaware of any related appeals, interferences or judicial proceedings that would have a bearing on the Board's decision in the instant appeal.

III. Status of Claims

Claims 1-37 stand rejected and are presented for appeal. A complete listing of the claims under appeal is provided in an Appendix to this Brief.

IV. Status of Amendments

No amendments have been filed subsequent to the Final Office Action dated July 30, 2007.

V. Summary of Claimed Subject Matter

Commensurate with independent claim 1, an example embodiment of the present invention is directed to an integrated microcircuit assaying arrangement including a circuit-supporting substrate, a light detection circuit and a processing circuit (*see, e.g.*, FIG. 1 and description at page 9:14 – 11:16). The light detection circuit (*e.g.*, 160 of FIG. 1 and page 10:17-27) is located on the substrate and arranged to detect an optical characteristic of a biological sample, and to generate a signal as a function of the detected optical characteristic. The processing circuit (*e.g.*, 180 of FIG. 1 and page 10:17-27) is communicatively coupled to the light detection circuit to receive the signal and includes an instruction-responsive processor, located on the substrate, to process the signal and to provide an assay output corresponding to the detected optical characteristic.

Commensurate with independent claim 10, another example embodiment of the present invention is directed to a microcircuit assaying chip including a light detection circuit and a processing circuit (*see, e.g.*, FIG. 1 and description at page 9:14 – 11:16). The light detection circuit (*e.g.*, 160 of FIG. 1 and page 10:17-27) is located on the chip, detects light from a biological sample and generates a signal including pixel data representing the detected light. The processing circuit (*e.g.*, 180 of FIG. 1 and page 10:17-27) is communicatively coupled to the detection circuit for receiving the pixel data and includes a processor on the chip. The processor is adapted to process the pixel data and to provide an output corresponding to the detected light represented by the pixel data.

Commensurate with independent claim 26, another example embodiment of the present invention is directed to an assaying arrangement. A sample preparation arrangement prepares a biological sample for assaying (*e.g.*, 140 of FIG. 1 and as described at page 9:14-10:16). A memory circuit and pixel array are located on a substrate, where each pixel includes a photodetector that detects light from a sample and that reads out data corresponding to the detected light (*see, e.g.*, FIG. 2 and discussion at page 11:17-12:8). A decoder circuit (*e.g.*, 220, 230 of FIG. 2 and at page 11:27-12:3) receives the data read out from the pixels and generates a signal in response to the data, the generated signal including data linking the location of the pixels in the array to the light detected at each pixel. An analog-to-digital converter (*e.g.*, 240 of FIG. 2 and at 12:1-5) converts analog data from the decoder circuit into digital data, and the memory circuit stores the converted data. A processor (*e.g.*, 260 of FIG. 2 and at 12:3-8) is also located on the substrate, communicatively coupled to the memory circuit and adapted to receive and process the stored digital data and to provide an output corresponding to the detected optical characteristic.

As required by 37 C.F.R. § 41.37(c)(1)(v), a concise explanation of the subject matter defined in the independent claims involved in the appeal is provided herein. Appellant notes that representative subject matter is identified for these claims; however, the abundance of supporting subject matter in the application prohibits identifying all textual and diagrammatic references to each claimed recitation. Appellant thus submits that other application subject matter, which supports the claims but is not specifically identified above, may be found

elsewhere in the application. Appellant further notes that this summary does not provide an exhaustive or exclusive view of the present subject matter, and Appellant refers to the appended claims and their legal equivalents for a complete statement of the invention.

VI. Grounds of Rejection to be Reviewed Upon Appeal

1. Whether the rejections of claims 1-30 under 35 U.S.C. § 103(a) over Goldman *et al.* (U.S. 6,825,927) in view of Wu (U.S. 6,617,565) are proper.

2. Whether the rejections of Claims 31-37 under 35 U.S.C. § 103(a) over Goldman *et al.* (U.S. 6,825,927) and Wu (U.S. 6,617,565) as applied to claim 26, and further in view of Herron *et al.* (U.S. 6,222,619), are proper.

VII. Argument

All of the claim rejections rely upon a proposed modification of the primary Goldman reference that cannot function as asserted by the Examiner because the modified structure would include power-consuming (and correspondingly, heat-generating) components that are not amenable to integration with Goldman's fluorometer device. This has been supported by uncontested evidence submitted by the Appellant in connection with the Final Office Action Response filed on October 1, 2007. The proposed modification of Goldman thus does not teach or suggest the claim limitations, cannot succeed as asserted, and lacks motivation for the proposed modification Goldman because the resulting structure would be subject to power consumption and overheating conditions that Goldman seeks to (and must) avoid.

In addition to the above, the Examiner's suggestion as to what is inherent (or "well known") as relevant to the proposed modification of the Goldman reference does not draw support from any prior art reference, is contrary to the disclosure in the Goldman reference and is correspondingly in contrast with relevant law. Moreover, the Examiner has not provided documentary evidence in support of these assertions and thus the Appellant has been denied its right to address and respond to any such evidence. Specifically, the Appellant traversed and pointed out the impropriety the Examiner's allegation that certain characteristics of the Goldman reference are inherent, and supported this impropriety with evidence as discussed above (*see, e.g.*, pages 2-3 of the Final Office Action Response filed on October 1, 2007). As is consistent with MPEP § 2144.03, the Examiner has improperly failed to provide evidence in support of the proposition that such teaching is inherent or well known in the prior art, and that there is adequate evidence of motivation to combine this prior art with the main reference.

The grounds of rejection are addressed more particularly in the following discussion.

1. **The rejections of claims 1-30 under 35 U.S.C. § 103(a) over Goldman *et al.* (U.S. 6,825,927) in view of Wu (U.S. 6,617,565) are improper.**

A. The rejection of claims 1-30 must be reversed because the Goldman reference cannot be modified as proposed.

Goldman's fluorometer controller - CCD camera cannot be integrated in a manner consistent with Wu's CMOS chip as suggested in the final Office Action. The final Office Action's suggestion that Goldman's fluorometer controller - CCD camera would function using Wu's CMOS sensor approach, simply because Wu and Goldman both involve optics, has not shown how Goldman's alleged CCD camera could be modified with Wu's CMOS approach, or how such a modification could function to arrive at the claimed invention. The Examiner's assertion that Goldman's fluorometer and alleged CCD arrangement would be implemented on a single chip using WU's CMOS technology is contrary to well-known characteristics of CCD cameras. Such characteristics are described, for example, in Holst, G., 1991. CCD Arrays, Cameras, and Displays, 2nd edition, SPIE Press, also as cited in Biosensors and Bioelectronics 19 (2004) 1377–1386 at 1381 (first column, line 3), which was attached to the October 1, 2007 Office Action Response and attached to this brief for convenience.

As described at page 1381 in the Biosensors and Bioelectronics article, the Examiner's proposed integration would involve the "use of several high supply voltages resulting in high power consumption." This article goes on to describe (on the same page) that "no other analog or digital circuits, such as for clock generation, timing, analog-to-digital (A/D) conversion, digital processing and storage, can be integrated with a CCD image sensor on a single chip" in that such combination results in "high power consumption, high cost, and large size." As consistent with the Holst referece, issues with CCD sensors stem from temperature and other operational characteristics that limit the application of CCD devices to low-cost, compact devices. CCD devices employ a readout mechanism to serially shift out photogenerated electrons accumulated at each photo site, and are fabricated using a nonstandard semiconductor process that is implemented for sensing and charge transfer. To mitigate noise, CCD devices are cooled, often using liquid nitrogen or a stack of Peltiers,

which is undesirable for various reasons. For instance, liquid nitrogen is expensive and cumbersome to implement (storage and application). Peltiers require the use of several high-voltage supplies that consume high power. In this regard, analog or digital circuits, such as those implemented for clock generation, timing, analog to digital (A/D) conversion, digital processing and storage, are not integrated with a CCD image sensor on a single chip.

In view of the above and the previously-submitted Biosensors and Bioelectronics article, CCD cameras implemented with Goldman's fluorometer would involve separate processing circuitry, and thus likely necessitate a multi-chip imaging system that exhibits relatively high power consumption, high cost and large size. In this regard, Goldman's fluorometer cannot be implemented with a CCD camera on a chip in a manner that is consistent with the Wu reference. The final Office Action has not provided any evidence from the prior art to the contrary, or explained how the proposed CCD camera fluorometer could or would function as asserted. Therefore, the rejection has not provided a combination of references with a showing that the proposed combination would function or is otherwise likely to succeed. As all of the Section 103 rejections rely upon the combination of Wu with Goldman, and as this combination does not meet the requirements for establishing obviousness under Section 103, the rejections must be reversed.

B. The rejection of claims 1-30 must be reversed because the Examiner has failed to provide any evidence in support of alleged inherent or well-known characteristics, denying the Appellant its right to address any such evidence.

All of the claim rejections rely upon allegedly inherent or well-known teachings, including those relating to a CCD device (in the primary Goldman reference) and to the integration of such a device on a common chip. These suggestions as to what is inherent (or well known) as relevant to the proposed modification of the Goldman reference were made without support from any prior art reference. The Appellant traversed and pointed out the impropriety the Examiner's allegation that certain characteristics of the Goldman reference are inherent, and supported this impropriety with evidence (*see, e.g.*, pages 2-3 of the Final Office Action Response filed on October 1, 2007). The evidence provided includes that described in the Holst reference, discussed and referenced above in item A. In response to

this traversal, the Examiner has not provided documentary evidence in support of these assertions of inherency. In this regard, and as is consistent with MPEP § 2144.03, the Examiner has improperly failed to provide evidence in support of the proposition that such teaching is inherent or well known in the prior art, and that there is adequate evidence of motivation to combine this prior art with the main reference. Appellant has therefore been denied its right to address and respond to any such evidence. All of the rejections, each of which relies upon these unsupported assertions of inherency, must therefore be reversed.

C. The rejection of claims 1-30 must be reversed because the proposed combination of Wu with Goldman does not provide teaching or suggestion of all of the claim limitations.

All of the claim rejections are also improper because the proposed combination of Wu with Goldman does not teach or suggest all of the claim limitations such as those directed to light detectors integrated with detector processing circuitry on a common chip, as relevant to the independent claims. The Examiner's citation to Wu, which discloses CMOS optical circuits on a common substrate (*e.g.*, FIG. 1), does not provide any teaching or suggestion as to how Goldman's fluorometer circuits could be so arranged, or how such an arrangement would function. That is, the rejection does not describe how Wu's CMOS integration approach would work for Goldmans fuorometer or a CCD arrangement as asserted by the Examiner, and thus does not provide an enabling embodiment that corresponds to the claimed invention. The above discussion in item A is relevant here, in that the proposed modification of Goldman to arrive at the claimed invention does not result in a functioning embodiment and thus fails to provide teaching or suggestion of all of the claim limitations.

In addition to the above, the assertions of what the Goldman reference *could* teach (with allegedly "inherent" CCD camera characteristics) fails to provide correspondence to the claimed limitations as required under Section 103, in that no evidence that teaches or suggests these inherent characteristics has been provided. In addition, the Examiner's suggestion that "it does not matter what types of optical detection devices" are described in

the respective references, even though the described devices are not interchangeable and cannot be implemented consistently, ignores the requirements under Section 103 and is contrary to M.P.E.P. Section 2141.01(a).

In view of the above, the proposed modification of the asserted fluorometer – CCD camera of the Goldman reference does not correspond to the claimed limitations. As all of the Section 103 rejections rely upon the combination of Wu with Goldman, and as this combination does not meet the requirements for establishing obviousness under Section 103, the rejections must be reversed.

D. The rejections of claims 1-30 must be reversed because the proposed modification of the primary Goldman reference is unsupported and unmotivated.

The Section 103(a) rejection of claims 1-30 must be reversed because the Examiner's rationale for modifying Goldman with the cited teachings of Wu stops short of providing any motivation for modifying Goldman's reference. In short, the Examiner has not shown how the asserted single-substrate or chip approach of Wu could be applicable to Goldman's fuorometer arrangement, and instead relies upon an assertion that the combination can be made simply because both the Wu and Goldman reference involve optics,. together with other unsupported statements relating to cost and/or size. This is contrary to the requirements of Section 103 and relevant law, including *KSR Int'l Co. v. Teleflex Inc.,* 127 S. Ct. 1727, 1741 (U.S. 2007), which indicates that "[a] patent composed of several elements is not proved obvious merely by demonstrating that each element was, independently, known in the prior art."

Other than asserting that both references generally relate to optics, the rejection does not cite any evidence showing why one of skill in the art would be motivated to make the proposed modification, or to include disparate sensor devices as suggested. For example, the Examiner's assertion that the type of optical detection device "does not matter" fails to address issues related to implementing a CCD-fluorometer in a single-chip application. In addition, the Response to Arguments at page 7 of the Final Office Action suggests that the proposed combination can "reduce the cost of device" and that "a compact device is

obtained" but is silent as to how Goldman's fluorometer controller would be reduced in cost, or how a compact device could be obtained. In view of the above discussion of CCD devices and as is well-known in the art, using a CCD camera with Goldman's fluorometer as suggested in the final Office Action would apparently not only increase cost, it would require that the device not be implemented on a common chip as claimed. Given the disparate nature of the references and the above discussion, Applicant cannot ascertain how these alleged cost reductions or compact structures would provide any motivation for modifying Goldman. Moreover, as is consistent with item A above, neither reference teaches or suggests that Goldman's fluorometer controller could function using Wu's CMOS circuit for large-item viewing and movement detection relative, for example, to size, sensitivity and noise, and neither reference suggests that Wu's integrated circuit could replace Goldman's detector and processor. In this regard, the Wu reference is not pertinent to the problem (the fluorometer) in the Goldman reference and there is no motivation, as the Office Action asserts, to combine Goldman's CCD camera and processing circuit on a single chip in view of Wu.

Accordingly, the Examiner has not provided evidence as to why one of skill in the art would find the asserted combination obvious as required because the Examiner has only provided general support for a single-chip sensor and unsupported statements as to alleged advantages of the proposed combination. No evidence has been provided to show how the Goldman reference could function as such. In particular view of the Biosensors and Bioelectronics article, it appears that no such motivation was present. In this regard, the requirement that the proposed modification of Goldman with Wu be motivated under Section 103 have not been met, and the rejection of all of claims 1-30 should be reversed.

2. The rejections of Claims 31-37 under 35 U.S.C. § 103(a) over Goldman *et al.* (U.S. 6,825,927) and Wu (U.S. 6,617,565) as applied to claim 26, and further in view of Herron *et al.* (U.S. 6,222,619), are improper.

Appellant notes that the rejection of claims 31-37 relies upon the combination of Wu with Goldman, which is improper for the reasons stated above in connection with the rejection of claims 1-30, which rely solely upon this combination. In this context and in conformance with rules regarding the format of this Appeal Brief, Appellant has reiterated

the above arguments as applicable to the further combination of Herron with Goldman, and has further addressed improprieties regarding to the lack of motivation as relative to the Herron reference under sub-heading D. In this regard, sub-headings A-C largely follow sub-headings A-C under the first ground of rejection, and sub-heading D further discusses issues relating to the combination of Herron with Goldman.

A. The rejection of claims 31-37 must be reversed because the Goldman reference cannot be modified as proposed.

Goldman's fluorometer controller - CCD camera cannot be integrated in a manner consistent with Wu's CMOS chip as suggested in the final Office Action. The final Office Action's suggestion that Goldman's fluorometer controller - CCD camera would function using Wu's CMOS sensor approach, simply because Wu and Goldman both involve optics, has not shown how Goldman's alleged CCD camera could be modified with Wu's CMOS approach, or how such a modification could function to arrive at the claimed invention. The Examiner's assertion that Goldman's fluorometer and alleged CCD arrangement would be implemented on a single chip using WU's CMOS technology is contrary to well-known characteristics of CCD cameras. Such characteristics are described, for example, in Holst, G., 1991. CCD Arrays, Cameras, and Displays, 2nd edition, SPIE Press, also as cited in Biosensors and Bioelectronics 19 (2004) 1377–1386 at 1381 (first column, line 3), which was attached to the October 1, 2007 Office Action Response and attached to this brief for convenience.

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photogenerated electrons accumulated at each photo site, and are fabricated using a nonstandard semiconductor process that is implemented for sensing and charge transfer. To mitigate noise, CCD devices are cooled, often using liquid nitrogen or a stack of Peltiers, which is undesirable for various reasons. For instance, liquid nitrogen is expensive and cumbersome to implement (storage and application). Peltiers require the use of several high-voltage supplies that consume high power. In this regard, analog or digital circuits, such as those implemented for clock generation, timing, analog to digital (A/D) conversion, digital processing and storage, are not integrated with a CCD image sensor on a single chip.

In view of the above and the previously-submitted Biosensors and Bioelectronics article, CCD cameras implemented with Goldman's fluorometer would involve separate processing circuitry, and thus likely necessitate a multi-chip imaging system that exhibits relatively high power consumption, high cost and large size. In this regard, Goldman's fluorometer cannot be implemented with a CCD camera on a chip in a manner that is consistent with the Wu reference. The final Office Action has not provided any evidence from the prior art to the contrary, or explained how the proposed CCD camera fluorometer could or would function as asserted. Therefore, the rejection has not provided a combination of references with a showing that the proposed combination would function or is otherwise likely to succeed. As all of the Section 103 rejections rely upon the combination of Wu with Goldman, and as this combination does not meet the requirements for establishing obviousness under Section 103, the rejections must be reversed.

B. The rejection of claims 31-37 must be reversed because the Examiner has failed to provide any evidence in support of alleged inherent or well-known characteristics, denying the Appellant its right to address any such evidence.

All of the claim rejections rely upon allegedly inherent or well-known teachings, including those relating to a CCD device (in the primary Goldman reference) and to the integration of such a device on a common chip. These suggestions as to what is inherent (or well known) as relevant to the proposed modification of the Goldman reference were made without support from any prior art reference. The Appellant traversed and pointed out the impropriety the Examiner's allegation that certain characteristics of the Goldman reference

are inherent, and supported this impropriety with evidence (*see, e.g.*, pages 2-3 of the Final Office Action Response filed on October 1, 2007). The evidence provided includes that described in the Holst reference, discussed and referenced above in item A. In response to this traversal, the Examiner has not provided documentary evidence in support of these assertions of inherency. In this regard, and as is consistent with MPEP § 2144.03, the Examiner has improperly failed to provide evidence in support of the proposition that such teaching is inherent or well known in the prior art, and that there is adequate evidence of motivation to combine this prior art with the main reference. Appellant has therefore been denied its right to address and respond to any such evidence. All of the rejections, each of which relies upon these unsupported assertions of inherency, must therefore be reversed.

C. The rejection of claims 31-37 must be reversed because the proposed combination of Wu with Goldman does not provide teaching or suggestion of all of the claim limitations.

All of the claim rejections are also improper because the proposed combination of Wu with Goldman does not teach or suggest all of the claim limitations such as those directed to light detectors integrated with detector processing circuitry on a common chip, as relevant to the independent claims. The Examiner's citation to Wu, which discloses CMOS optical circuits on a common substrate (*e.g.*, FIG. 1), does not provide any teaching or suggestion as to how Goldman's fluorometer circuits could be so arranged, or how such an arrangement would function. That is, the rejection does not describe how Wu's CMOS integration approach would work for Goldmans fuorometer or a CCD arrangement as asserted by the Examiner, and thus does not provide an enabling embodiment that corresponds to the claimed invention. The above discussion in item A is relevant here, in that the proposed modification of Goldman to arrive at the claimed invention does not result in a functioning embodiment and thus fails to provide teaching or suggestion of all of the claim limitations.

In addition to the above, the assertions of what the Goldman reference *could* teach (with allegedly "inherent" CCD camera characteristics) fails to provide correspondence to

the claimed limitations as required under Section 103, in that no evidence that teaches or suggests these inherent characteristics has been provided. In addition, the Examiner's suggestion that "it does not matter what types of optical detection devices" are described in the respective references, even though the described devices are not interchangeable and cannot be implemented consistently, ignores the requirements under Section 103 and is contrary to M.P.E.P. Section 2141.01(a).

In view of the above, the proposed modification of the asserted fluorometer – CCD camera of the Goldman reference does not correspond to the claimed limitations. As all of the Section 103 rejections rely upon the combination of Wu with Goldman, and as this combination does not meet the requirements for establishing obviousness under Section 103, the rejections must be reversed.

D. The rejections of claims 31-37 must be reversed because the proposed modification of the primary Goldman reference is unsupported and unmotivated.

The Section 103(a) rejection of claims 31-37 must be reversed because the Examiner's rationale for modifying Goldman with the cited teachings of Wu and Herron stops short of providing any motivation for modifying Goldman's reference. In short, the Examiner has not shown how the asserted single-substrate or chip approach of Wu could be applicable to Goldman's fuorometer arrangement, and instead relies upon an assertion that the combination can be made simply because both the Wu and Goldman reference involve optics, together with other unsupported statements relating to cost and/or size. Regarding Herron, the Examiner's motivation relies solely upon the Examiner's assertion that one of skill in the art would be motivated "because they are function in the same manner" but is devoid of any discussion as to why one of skill in the art would be motivated to make the asserted combination. This is contrary to the requirements of Section 103 and relevant law, including *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1741 (U.S. 2007), which indicates that "[a] patent composed of several elements is not proved obvious merely by demonstrating that each element was, independently, known in the prior art."

Regarding the Wu and Goldman references, other than asserting that both references generally relate to optics, the rejection does not cite any evidence showing why one of skill in the art would be motivated to make the proposed modification, or to include disparate sensor devices as suggested. For example, the Examiner's assertion that the type of optical detection device "does not matter" fails to address issues related to implementing a CCD-fluorometer in a single-chip application. In addition, the Response to Arguments at page 7 of the Final Office Action suggests that the proposed combination can "reduce the cost of device" and that "a compact device is obtained" but is silent as to how Goldman's fluorometer controller would be reduced in cost, or how a compact device could be obtained. In view of the above discussion of CCD devices and as is well-known in the art, using a CCD camera with Goldman's fluorometer as suggested in the final Office Action would apparently not only increase cost, it would require that the device not be implemented on a common chip as claimed. Given the disparate nature of the references and the above discussion, Applicant cannot ascertain how these alleged cost reductions or compact structures would provide any motivation for modifying Goldman. Moreover, as is consistent with item A above, neither reference teaches or suggests that Goldman's fluorometer controller could function using Wu's CMOS circuit for large-item viewing and movement detection relative, for example, to size, sensitivity and noise, and neither reference suggests that Wu's integrated circuit could replace Goldman's detector and processor. In this regard, the Wu reference is not pertinent to the problem (the fluorometer) in the Goldman reference and there is no motivation, as the Office Action asserts, to combine Goldman's CCD camera and processing circuit on a single chip in view of Wu.

Regarding the combination of Herron with Goldman, Appellant submits that an assertion that the references simply "function in the same manner" stops far short of providing evidence of motivation as required to support a Section 103 rejection. For example, the Examiner has not explained or cited evidence showing how Herron's reservoirs would or could be implemented with Goldman's device, or why such implementation would be advantageous.

Accordingly, the Examiner has not provided evidence as to why one of skill in the art would find the asserted combination obvious as required. The Examiner has only provided

general support for a single-chip sensor and unsupported statements as to alleged advantages of the proposed combination of Wu with Goldman, and has provided no indication of desirability for combining Herron with Goldman, instead relying upon a statement that the references "function in the same manner." No evidence has been provided to show how the Goldman reference could function as proposed with the teachings in either the Wu or Herron reference. Regarding the Wu reference, in particular view of the Biosensors and Bioelectronics article, it appears that no such motivation was present. In this regard, the requirement that the proposed modification of Goldman with Wu and Herron be motivated under Section 103 have not been met, and the rejection of all of claims 31-37 should be reversed.

VIII. Conclusion

In view of the above, Appellant submits that the rejections of claims 1-37 are improper. Appellant therefore requests reversal of the rejections as applied to the appealed claims and allowance of the entire application.

Authority to charge the undersigned's deposit account was provided on the first page of this brief.

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Respectfully Submitted,

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APPENDIX OF CLAIMS INVOLVED IN THE APPEAL
(S/N 10/663,935)

1. An integrated microcircuit assaying arrangement comprising:

a circuit-supporting substrate;

a light detection circuit on the substrate and arranged to detect an optical characteristic of a biological sample and generate a signal as a function of the detected optical characteristic; and

a processing circuit communicatively coupled to the light detection circuit to receive the signal and including an instruction-responsive processor on the substrate and adapted to process the signal and to provide an assay output corresponding to the detected optical characteristic.

2. The microcircuit assaying arrangement of claim 1, wherein the processing circuit further comprises:

a data storage circuit on the substrate, coupled to the processor and adapted to store data, the processor being adapted to retrieve data from the data storage circuit for processing the signal and providing the output.

3. The microcircuit assaying arrangement of claim 1, wherein at least one of the light detection circuit and the processing circuit includes MOS-based circuitry.

4. The microcircuit assaying arrangement of claim 1, wherein the light detection circuit includes a photodetector circuit that electrically responds to light from the biological sample and generates the signal, and further comprising a temperature controller configured and arranged to control the temperature of the light detection circuit.

5. The microcircuit assaying arrangement of claim 4, wherein the photodetector circuit includes at least one photodiode adapted to electrically respond to light from the biological sample.

6. The microcircuit assaying arrangement of claim 1, further comprising a color filter adapted to remove a portion of the signal generated by the light detection circuit that corresponds to a particular color of light

7. The microcircuit assaying arrangement of claim 1, further comprising a clock generation circuit on the substrate and adapted to generate a clock signal, the processing circuit being operable in response to the clock signal.

8. The microcircuit assaying arrangement of claim 7, wherein the processing circuit is adapted to operate at a selected speed in response to programming data.

9. The microcircuit assaying arrangement of claim 1, wherein the microcircuit assaying arrangement includes both analog and digital circuitry, further comprising an analog-to-digital converter (ADC) on the substrate and adapted to convert an analog signal to a digital signal for generating said signal as a function of the detected optical characteristic.

10. A microcircuit assaying chip comprising:

a light detection circuit on the chip and adapted to detect light from a biological sample and generate a signal including pixel data representing the detected light; and

a processing circuit communicatively coupled to the detection circuit for receiving the pixel data and including a processor on the chip, the processor adapted to process the pixel data and to provide an output corresponding to the detected light represented by the pixel data.

11. The microcircuit assaying chip of claim 10, wherein the light detection circuit includes a plurality of light detectors adapted to detect the light from the biological sample and generate the pixel data, and wherein the processing circuit is programmed to provide the output including pixels having pixel data from the light detectors.

12. The microcircuit assaying chip of claim 11, wherein the photosensitive area is matched to the assay size from 1 μm to 2 mm.

13. The microcircuit assaying chip of claim 12, wherein the processing circuit is programmed to compensate for the quantum efficiency of a reaction involving the biological sample.

14. The microcircuit assaying chip of claim 12, wherein the plurality of light detectors are in an array and wherein the processing circuit is adapted to include, for each pixel in the output, pixel data from a block including at least two immediately adjacent light detectors.

15. The microcircuit assaying chip of claim 10, wherein the light detection circuit includes a photodiode adapted to detect the light by converting photons received from the biological sample into a charge having a value that is a function of the intensity of the detected light to generate the signal including pixel data having a value that is representative of the charge.

16. The microcircuit assaying chip of claim 15, wherein the processing circuit is adapted to scale the value of the pixel data in the generated signal to compensate for the quantum efficiency of a reaction with the biological sample.

17. The microcircuit assaying chip of claim 10, wherein the light detection circuit includes analog circuitry, further comprising a digital-to-analog converter (DAC) adapted to convert a digital control signal to an analog signal for operating the detection circuit.

18. The microcircuit assaying chip of claim 10, further comprising a control circuit coupled to an external input indicative of the stimulation of the biological sample and adapted to control the light detection circuit to detect light at a selected time in response to the external input for coordinating the light detection with the stimulation.

19. The microcircuit assaying chip of claim 10, wherein the light detection circuit and processing circuit are adapted for capturing a single image of the biological sample using light detected by the light detection circuit.

20. The microcircuit assaying chip of claim 10, wherein the light detection circuit and processing circuit are adapted to capture a plurality of images of the biological sample using the light detected by the light detection circuit and wherein the processor is adapted to provide the output including image data.

21. The microcircuit assaying chip of claim 10, wherein the light detection circuit includes a plurality of light detectors, at least two of the light detectors being adapted to detect different light characteristics, and wherein the processing circuit is adapted to detect a characteristic of the biological sample using different characteristics of the biological sample detected by the at least two light detectors.

22. The microcircuit assaying chip of claim 10, further comprising a noise reduction circuit adapted to reduce noise in the assay output.

23. The microcircuit assaying chip of claim 22, wherein the noise reduction circuit includes a background subtraction circuit adapted to reduce background noise in the signal generated by the light detection circuit.

24. The microcircuit assaying chip of claim 23, wherein the background subtraction circuit removes the deterministic component of the signal generated by the light detection circuit as engendered by photodetector dark signal, chemical background or external excitation sources.

25. The microcircuit assaying chip of claim 22, wherein the noise reduction circuit includes a signal averaging circuit adapted to reduce independent noise components in the signal generated by the light detection circuit.

26. An assaying arrangement comprising:

a sample preparation arrangement configured and arranged for preparation of a biological sample for assaying;

a substrate;

a memory circuit on the substrate;

an array of pixels on the substrate, each pixel including a photodetector adapted to detect light from the sample and to read out data corresponding to the detected light;

a decoder circuit adapted to receive the data read out from the pixels and to generate a signal in response to the data, the generated signal including data linking the location of the pixels in the array to the light detected at each pixel;

an analog-to-digital converter adapted to convert analog data from the decoder circuit into digital data, the memory circuit being adapted to store the converted data; and

a processor on the substrate, communicatively coupled to the memory circuit and adapted to receive and process the stored digital data and to provide an output corresponding to the detected optical characteristic.

27. The assaying arrangement of claim 26, further comprising:

a controller adapted to synchronize the operation of the circuitry on the substrate and control the flow of information between the circuits on the substrate; and

a digital-to-analog converter (DAC) adapted to convert digital signals from the controller into analog signals for controlling the photodetectors and the decoder circuit.

28. The assaying arrangement of claim 27, wherein the controller is adapted to synchronize the detection of light by the photodetector with stimulation of the biological sample that causes a light emission.

29. The assaying arrangement of claim 27, wherein the array of pixels includes pixels adapted to detect different characteristics and wherein the controller is adapted to selectively power and process the different photodetectors for detecting the different characteristics.

30. The assaying arrangement of claim 26, further comprising a clock generation circuit on the substrate and adapted to generate a clock signal, the circuits on the substrate being operable in response to the clock signal.

31. The assaying arrangement of claim 26, wherein the sample preparation device includes:

at least one reservoir; and

a fluid delivery arrangement adapted to deliver the biological sample to the at least one reservoir.

32. The assaying arrangement of claim 31, wherein the fluid delivery arrangement is further adapted to deliver a reagent to the at least one reservoir.

33. The assaying arrangement of claim 31, wherein the sample preparation device includes a plurality of reservoirs coupled via micro channels.

34. (Currently Amended) The assaying arrangement of claim 26, wherein the sample arrangement involves directly coupling or immobilizing the samples to the photodetector substrate.

35. The assaying arrangement of claim 34, wherein the photodetector substrate is etched with at least one reservoir.

36. The assaying arrangement of claim 31, wherein the sample preparation device is directly coupled to the sensor substrate.

37. The assaying arrangement of claim 31, wherein the sample preparation device is optically coupled to the sensor substrate.

APPENDIX OF EVIDENCE

Appellant is unaware of any evidence submitted in this application pursuant to 37 C.F.R. §§ 1.130, 1.131, and 1.132.

APPENDIX OF RELATED PROCEEDINGS

As stated in Section II above, Appellant is unaware of any related appeals, interferences or judicial proceedings.